

CLAIMS

1. Subscriber terminal (SS) of a communication system (SYS) for performing packet data transfer on a connection (UL, DL) between the subscriber terminal (SS) side and a network side (NS), wherein during a data packet transfer a physical connection (TBF) is maintained which indicates in the subscriber terminal (SS) and the network side (NS) that the subscriber terminal (SS) and the network side (NS) are valid for performing said packet data transfer, *comprising*
  - a) a transmission detector (TDET1) including an active period detector (AP-DET) for monitoring, during a data packet transfer from said subscriber terminal side (SS) to said network side (NS), the inter-arrival time (TDIFF) of data packets (DP) and for determining as an active period (AP) the period from a first data packet (DP1) to a last data packet (DPn) for which each monitored inter-arrival time (TDIFF) falls in a predetermined range (TRA); and
  - b) a physical connection controller (LC-CTRL) including a physical connection maintaining device (LC-MAIN) for maintaining said physical connection between said subscriber terminal (SS) side and said network side (NS) in said active period (AP).
2. A subscriber terminal according to claim 1, *wherein*

said active period detector (AP-DET) is further adapted for detecting silence periods (SP) in which no

data packets for data packet transfer are available on said subscriber terminal side (SS); and

said physical connection controller (LC-CTRL) includes a physical connection terminator (LC-TERM) for terminating said physical connection (LC) during said silence periods (SP) detected by said active period detector (AP-DET).

3. A subscriber terminal (SS) according to claim 1 or 2,  
**wherein**

said active period detector (AP-DET) comprises a real-time application data detector (RT-DET) for detecting whether said data packets (DP) are real-time data packets.

4. A subscriber terminal according to claim 1 or 2 or 3,  
**wherein**

said physical connection maintaining device (LC-MAIN) for maintaining said physical connection between said subscriber terminal (SS) side and said network side (NS) in said active period (AP) comprises a data packet transmission delay device (DP-DLY) for delaying the transmission of a data packet (DP1) at least for the inter-arrival time (TDIFF) as monitored by said active period detector (AP-DET).

5. A subscriber terminal according to one or more of claims 1-4,  
**comprising**

a subscriber terminal side transmitter queue (TR-QUE) from which data packets (DP) are successively transmitted to the network side (NS);

a subscriber terminal side transmitter queue monitoring device (QUE-MON) for determining whether

the transmitter queue (TR-QUE) comprises data packets (DP) to be transmitted;

a subscriber terminal side transmitter queue information setting means (CV-SET) for determining, on the basis of the determination made by said transmitter queue monitoring means (QUE-MON), a transmitter queue (TR-QUE) information (CV) indicating whether the transmitter queue (TR-QUE) is empty (CV=0) or whether the transmitter queue (TR-QUE) contains at least one data packet to be transmitted to the network side (CV>0); and

a subscriber terminal side transmitter (SS-TR) for transmitting to said network side (NS) data packets (DP) from the transmitter queue (TR-QUE) and for transmitting in association with a respective data packet (DP) said transmitter queue (TR-QUE) information (CV).

6. A subscriber terminal (Fig. 9) according to claim 5,

**wherein**

said physical connection maintaining device (LC-MAIN) comprises a subscriber terminal side timer (T) for counting the inter-arrival time (TDIFF) when a respective data packet (DP) is transmitted;

wherein if said subscriber terminal side transmitter queue monitoring device (QUE-MON) does not determine an entry of a new data packet (DP) in the transmitter queue (TR-QUE) in said counted inter-arrival time (TDIFF), said subscriber terminal side transmitter (SS-TR) transmits a special data packet (DP) to the network side and in association therewith a transmitter queue (TR-QUE) information (CV) indicating that the transmitter queue (TR-QUE) is empty.

7. A subscriber terminal (Fig. 9) according to claim 6,  
**wherein**

said special data packet (DP) is the last transmitted data packet (DP) or a dummy data packet (DP).

8. A subscriber terminal according to claim 5,  
**comprising**

an uplink release acknowledgement message detector (UP ACK/NACK) for determining the receipt of an uplink release acknowledgement message (PACKET UPLINK ACK/NACK; FAI=1) transmitted from the network side (NS) in response to receiving a transmitter queue (TR-QUE) information (CV=0) indicating that the transmitter queue (TR-QUE) is empty; wherein

if said subscriber terminal transmitter queue (TR-QUE) monitoring means (TR-MON) detects a new entry of data packet (DP) in said transmitter queue (TR-QUE) after said subscriber terminal transmitter (SS-TR) has transmitted a transmitter queue (TR-QUE) information (CV=0) indicating that the transmitter queue (TR-QUE) is empty, an uplink release acknowledgement message (PACKET UPLINK ACK/NACK; FAI=1) detected by said uplink release acknowledgement message detector (UP ACK/NACK) is not answered by transmitting an uplink release confirmation message (PACKET CONTROL ACK) but by transmitting said new data packet (DP) by said subscriber terminal transmitter (TR) for maintaining said physical connection (TBF).

9. A subscriber terminal according to one or more claims 1 to 8,  
**wherein**

said transmitter queue information (CV) is transmitted in a respective data packet (DP).

10. A communication system (SYS) for performing packet data transfer on a connection (UL, DL) between the subscriber terminal (SS) side and a network side (NS), wherein during a data packet transfer a physical connection (TBF) is maintained which indicates in the subscriber terminal (SS) and the network side (NS) that the subscriber terminal (SS) and the network side (NS) are capable of performing said packet data transfer, comprising at least one subscriber terminal (SS) according to one or more of claims 1-9.
  
11. A network controller (NC) of a communication system (SYS) for performing packet data transfer on a connection (UL, DL) between a subscriber terminal (SS) side and a network side (NS), wherein during a data packet transfer a physical connection (TBF) is maintained which indicates in the subscriber terminal (SS) and the network side (NS) that the subscriber terminal (SS) and the network side (NS) are valid for performing said packet data transfer, **comprising**
  - a) a transmission detector (TDET1) including an active period detector (AP-DET) for monitoring, during a data packet transfer from said network side (NS) to said subscriber terminal side (NS), the inter-arrival time (TDIFF) of data packets (DP) and for determining as an active period (AP) the period from a first data packet (DP1) to a last data packet (DPn) for which each monitored inter-arrival time (TDIFF) falls in a predetermined range (TRA); and
  
  - b) a physical connection controller (LC-CTRL) including a physical connection maintaining device (LC-MAIN) for maintaining said physical connection between said subscriber terminal (SS)

side and said network side (NS) in said active period (AP).

12. A network controller (NC) according to claim 11,

**wherein**

said active period detector (AP-DET) is further adapted for detecting silence periods (SP) in which no data packets for data packet transfer are available on said network side (NS); and

said physical connection controller (LC-CTRL) includes a physical connection terminator (LC-TERM) for terminating said physical connection (LC) during said silence periods (SP) detected by said active period detector (AP-DET).

13. A network controller (NC) according to claim 11 or 12,

**wherein**

said active period detector (AP-DET) comprises a real-time application data detector (RT-DET) for detecting whether said data packets (DP) to be transmitted from said network side (NS) are real-time data packets.

14. A network controller (NC) according to one or more of claims 11-13,

**wherein**

said physical connection maintaining device (LC-MAIN) for maintaining said physical connection between said subscriber terminal (SS) side and said network side (NS) in said active period (AP) comprises a data packet transmission delay device (DP-DLY) for delaying the transmission of a data packet (DP1) at least for the inter-arrival time (TDIFF) as monitored by said active period detector (AP-DET).

15. A network controller (NC) (Fig. 6) according to claim 11,

**comprising**

a network side transmitter queue (TR-QUE) from which data packets (DP) are successively transmitted to the subscriber terminal side (SS);

a network side transmitter queue monitoring device (QUE-MON) for determining whether the transmitter queue (TR-QUE) comprises data packets (DP) to be transmitted;

a network side transmitter queue information setting means (FBI-SET) for determining, on the basis of the determination made by said transmitter queue monitoring means (QUE-MON), a transmitter queue (TR-QUE) information (FBI) indicating whether the transmitter queue (TR-QUE) is empty (FBI=1) or whether the transmitter queue (TR-QUE) contains at least one data packet to be transmitted to the subscriber terminal side (FBI=0); and

a network side transmitter (NS-TR) for transmitting to said subscriber terminal side (SS) data packets (DP) from the transmitter queue (TR-QUE) and for transmitting in association with a respective data packet (DP) said transmitter queue (TR-QUE) information (FBI).

16. A network controller (NC) (Fig. 5) according to claim 15,

**wherein**

said physical connection maintaining device (LC-MAIN) comprises a network side timer (T) for counting the inter-arrival time (TDIFF) when a respective data packet (DP) is transmitted;

wherein if said network side transmitter queue monitoring device (QUE-MON) does not determine an entry of a new data packet (DP) in the transmitter queue (TR-QUE) in said counted inter-arrival time (TDIFF), said network side transmitter (SS-TR) transmits a special data packet (DP) to the subscriber terminal side and in association therewith a transmitter queue (TR-QUE) information (FBI=1) indicating that the transmitter queue (TR-QUE) is empty.

17. A network controller (NC) (Fig. 5) according to claim 16,

**wherein**

said special data packet (DP) is the last transmitted data packet (DP) or a dummy data packet (DP).

18. A network controller (NC) according to claim 15,

**wherein**

said physical connection maintaining device (LC-MAIN) comprises a network side timer (T) for counting the inter-arrival time (TDIFF) when a respective data packet (DP) is transmitted;

wherein if said network side transmitter queue monitoring device (QUE-MON) does not determine an entry of a new data packet (DP) in the transmitter queue (TR-QUE) in said counted inter-arrival time (TDIFF), said network side transmitter (SS-TR) transmits a packet switched signalling message (PACKET TBF Release) to the subscriber terminal (SS) side and in association therewith a transmitter queue (TR-QUE) information (FBI=1) indicating that the transmitter queue (TR-QUE) is empty.



19. A network controller according to one or more claims 15 to 18,  
**wherein**  
 said transmitter queue information (FBI) is  
 transmitted in a respective data packet (DP).
  
20. A communication system (SYS) for performing packet data transfer on a connection (UL, DL) between the subscriber terminal (SS) side and a network side (NS), wherein during a data packet transfer a physical connection (TBF) is maintained which indicates in the subscriber terminal (SS) and the network side (NS) that the subscriber terminal (SS) and the network side (NS) are capable of performing said packet data transfer, comprising at least one network controller (NC) according to one or more of claims 11-19.
  
21. A communication system (SYS) for performing packet data transfer on a connection (UL, DL) between the subscriber terminal (SS) side and a network side (NS), wherein during a data packet transfer a physical connection (TBF) is maintained which indicates in the subscriber terminal (SS) and the network side (NS) that the subscriber terminal (SS) and the network side (NS) are capable of performing said packet data transfer, comprising at least one subscriber terminal (SS) according to one or more of claims 1-9 and at least one network controller (NC) according to one or more of claims 11-19.
  
22. A method for performing in a communication system (SYS) a packet data transfer on a connection (UL, DL) between a subscriber terminal (SS) side and a network side (NS), with the following steps:

- a) maintaining (ST85, ST83) during a data packet transfer on said connection a physical connection (TBF) which indicates in the subscriber terminal (SS) and the network side (NS) that the subscriber terminal (SS) and the network side (NS) are valid for performing said packet data transfer,

*comprising the following steps:*

- b) monitoring (ST82), during a data packet transfer from said subscriber terminal side (SS) to said network side (NS), the inter-arrival time (TDIFF) of data packets (DP) and determining as an active period (AP) the period from a first data packet (DP1) to a last data packet (DPn) for which each monitored inter-arrival time (TDIFF) falls in a predetermined range (TRA); and
- c) wherein said physical connection between said subscriber terminal (SS) side and said network side (NS) is maintained (ST85) in said active period (AP).

23. A method according to claim 22,

*comprising*

detecting (ST82) silence periods (SP) in which no data packets for data packet transfer are available on said subscriber terminal side (SS); and

terminating (ST83) said physical connection (LC) during said silence periods (SP).

24. A method according to claim 22 or 23,

*comprising*

detecting whether said data packets (DP) are real-time data packets.

25. A method according to claim 22 or 23 or 24,

*comprising*

delaying the transmission of a data packet (DP1) at least for the inter-arrival time (TDIFF) as monitored by said active period detector (AP-DET).

26. A method (Fig. 5) according to claim 22,

*comprising*

transmitting (ST80, ST80') from a transmitter queue (TR-QUE) data packets (DP);

determining (QUE-MON) whether the transmitter queue (TR-QUE) comprises data packets (DP) to be transmitted;

determining (CV-SET) a transmitter queue (TR-QUE) information (CV) indicating whether the transmitter queue (TR-QUE) is empty (CV=0) or whether the transmitter queue (TR-QUE) contains at least one data packet to be transmitted to the network side (CV>0); and

transmitting data packets (DP) from the transmitter queue (TR-QUE) and in association with a respective data packet (DP) said transmitter queue (TR-QUE) information (CV).

27. A method according to claim 26,

*comprising*

counting (ST91', ST94', ST101') the inter-arrival time (TDIFF) when a respective data packet (DP) is transmitted;

wherein if an entry of a new data packet (DP) into the transmitter queue (TR-QUE) is not determined in said counted inter-arrival time (TDIFF), transmitting (ST95, ST102) a special data packet (DP) from the network side and in association therewith a transmitter queue (TR-QUE) information (CV) indicating that the transmitter queue (TR-QUE) is empty.

28. A method according to claim 27,

*comprising*

transmitting (ST95, ST102) as said special data packet (DP) the last transmitted data packet (DP) or a dummy data packet (DP).

29. A method according to claim 26,

*comprising*

receiving (ST5a1) on the network side (NS) a transmitter queue (TR-QUE) information (CV=0) indicating that the transmitter queue (TR-QUE) is empty;

transmitting (ST5a2) an uplink release acknowledgement message (PACKET UPLINK ACK/NACK; FAI=1) from the network side (NS) to the subscriber terminal (SS) side;

determining (ST5a1', ST5a2') in the subscriber terminal side the receipt of said uplink release acknowledgement message (PACKET UPLINK ACK/NACK; FAI=1);

if a new entry of data packet (DP) in said transmitter queue (TR-QUE) is detected (ST5a1', ST5a2') after said subscriber terminal transmitter (SS-TR) has transmitted a transmitter queue (TR-QUE) information (CV=0) indicating that the transmitter queue (TR-QUE)

is empty, said subscriber terminal does not answer the uplink release acknowledgement message (PACKET UPLINK ACK/NACK; FAI=1) by transmitting (ST5a3) an uplink release confirmation message (PACKET CONTROL ACK) but by transmitting (ST5a3') said new data packet (DP) for maintaining said physical connection (TBF).

30. A method according to one or more claims 22 to 29,

*wherein*

said transmitter queue information (CV) is transmitted in a respective data packet (DP).

31. A method according to claim 26,

*comprising*

counting (ST111', ST114') the inter-arrival time (TDIFF) when a respective data packet (DP) is transmitted;

wherein if an entry of a new data packet (DP) into the transmitter queue (TR-QUE) is not determined in said counted inter-arrival time (TDIFF), transmitting (ST115) a signalling message (PACKET TBF Release) from the network side (NS) and in association therewith a transmitter queue (TR-QUE) information (CV) indicating that the transmitter queue (TR-QUE) is empty.